

a P-polarized light component, is guided using the polarization converting element according to any one of claims 10 to 12 toward modulating means for modulating the light beam on the basis of an image signal and the light beam modulated by said modulating means is projected onto a predetermined surface by a projection optical system.

15. (Not Amended) A projection type display apparatus according to claim 14, wherein said image signal is controlled in response to a signal supplied from an image processing means.

REMARKS

Claims 1-15 are presented for consideration, with Claim 1 being independent.

The specification and abstract have been reviewed and amended to correct minor informality and improve their idiomatic English form.

Independent Claim 1 has been amended to further distinguish Applicant's invention from the cited art. In addition, editorial changes have been made to selected dependent claims.

Claims 1-9 stand rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Aoyama '903. In addition, Claims 10-15 were rejected under 35 U.S.C. §103 as allegedly being obvious over Aoyama in view of European Patent No. 821,258. These rejections are respectfully traversed.

Applicant's invention as set forth in Claim 1 relates to a diffractive optical element comprising a grating structure having at least two blazed type grating portions

successively arranged along a light traveling direction. In at least one grating portion, structures smaller than a used wavelength are arranged in a periodic manner.

In accordance with Applicant's claimed invention, an effective and economical diffractive optical element can be provided.

The primary citation to Aoyama relates to an optical element that includes a grating structure. In the embodiment shown in Figures 6 and 7, a Fresnel lens pattern 21 and a grating 22 are provided on a transparent substrate. In Figures 9-11, a composite grating pattern on a substrate 30 is formed of a high density linear grating 32 superimposed on a Fresnel lens pattern 31.

In contrast to Applicant's claimed invention, however, Aoyama is not understood to teach or suggest, among other features, two blazed type grating portions successively arranged along a light traveling direction. Accordingly, it is respectfully submitted that Aoyama fails to anticipate or render obvious Applicant's claimed invention. Reconsideration and withdrawal of the rejection of Claims 1-9 under 35 U.S.C. §102 is therefore respectfully requested.

The secondary citation to EP '258 relates to an optical element and was cited for its teaching of a polarization converting element. This reference fails, however, to compensate for the deficiencies in Aoyama as discussed above with respect to Applicant's independent Claim 1.

Therefore, without conceding the propriety of combining Aoyama and EP '258 in the manner proposed in the Office Action, such a combination still fails to teach or suggest

Applicant's claimed invention. Accordingly, reconsideration and withdrawal of the rejection of Claims 10-15 under 35 U.S.C. §103 is respectfully requested.

Accordingly, it is submitted that Applicant's invention as set forth in independent Claim 1 is patentable over the cited art. In addition, dependent Claims 2-15 set forth additional features of Applicant's invention. Independent consideration of the dependent claims is respectfully requested.

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

In compliance with the duty of disclosure under 37 C.F.R. §1.56 and in accordance with the practice under 37 C.F.R. §§1.97 and 1.98, the Examiner's attention is directed to the documents listed on the enclosed Form PTO-1449. Copies of the listed documents are also enclosed.

Accompanying this paper is a check for \$180.00 pursuant to 37 C.F.R. §1.97(c) and §1.17(p).

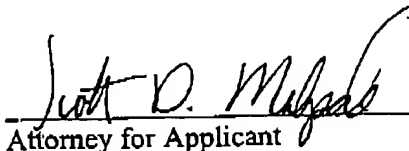
It is respectfully requested that the above information be considered by the Examiner and that a copy of the enclosed Form PTO-1449 be returned indicating that such information has been considered.

CONCLUSION

In view of the foregoing, reconsideration and allowance of this application is deemed to be in order and such action is respectfully requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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Attorney Docket No.: 03500.015390

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO SPECIFICATION

The paragraph starting at page 2, line 10 and ending at line 19 has been amended as follows:

As to this SWS grating, it is known that such SWS gratings may own various functions such as a double refraction (birefringence) wavelength plate, an antireflection structure, and a polarization beam splitter, depending upon grating structures thereof. Then, as to these functions, various reports have been made in which there is a small optical performance variation caused by changes in incident angles of light [beames] beams entered into this SWS grating, and the SWS grating may have optically superior features.

The paragraph starting at page 12, line 3 and ending at line 5 has been amended as follows:

--Fig. 1 is a perspective view for representing a diffractive optical element according to an embodiment 1 of the present invention;

The paragraph starting at page 13, line 20 and ending at line 23 has been amended as follows:

Fig. 1 is a perspective view for indicating a diffractive optical element which performs a [polization] polarization separation operation, according to an embodiment 1 of the present invention.

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The paragraph starting at page 13, line 24 and ending at page 14, line 1 has been amended as follows:

In the diffractive optical element 1 for performing the [polization] polarization separation operation, a diffraction grating 3 capable of performing the [polarization] polarization separation operation is provided on a substrate 2.

The paragraph starting at page 14, line 2 and ending at line 11 has been amended as follows:

The diffraction grating 3 is constituted by [an] a one-dimensional blazed type grating shape, and has a grating period "P_t" along a direction of 2 - 2 shown in this drawing. In the diffractive optical element 1, diffraction directions of light [beames] beams incident on diffractive optical element 1 are made different from each other, depending upon polarization directions thereof. Further, this diffraction grating 3 is set in such a manner that each of polarized lights is diffracted only at a specific diffraction order.

The paragraph starting at page 15, line 19 and ending at line 27 has been amended as follows:

One the other hand, the second diffraction grating portion 5 has an SWS grating structur in which the material $n_1(\lambda)$ and the material $n_2(\lambda)$ are alternatively repeated with a minute period smaller than the wavelength of the light used. The grating pitch of the SWS

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grating is "P1", and an occupation ratio of the material $n_2(\lambda)$ which is occupied within the grating pitch "P1" is equal to $F = f_1 / P_1$ (will be referred to as a "filling factor" hereinafter).

The paragraph starting at page 15, line 1 and ending at line 4 has been amended as follows:

The shape of this second diffraction grating portion 5 is such [an] a one-dimensional rectangular grating shape having a period parallel to the grating pitch "P1" of the first diffraction grating portion 4.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE ABSTRACT

The Abstract of the Disclosure section starting at page 34, line 2 and ending at line 14 has been amended as follows:

In a diffractive optical element and a polarization separation element using this diffractive optical element, incident light can be effectively separated for the respective polarization directions over the entire used wavelength range. The diffractive optical element is arranged such that the diffractive optical element has a grating structure in which at least two blazed type grating [portions] portions are [overlapped with each other, and] successively arranged along a light traveling direction. Additionally, in at least one grating portion of the two blazed type grating portions, structures smaller than a used wavelength are arranged in a periodic manner [on all of light incident surfaces thereof].

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Amended) A diffractive optical element, [wherein said diffractive optical element has] comprising:
 - a grating structure [in which] having at least two blazed type grating portions [are overlapped with each other] successively arranged along a light traveling direction,
 - [and] wherein
 - in at least one grating portion of said two blazed type grating portions, structures smaller than a used wavelength are arranged in a periodic manner [on all of light incident surfaces thereof].
5. (Amended) A diffractive optical element according to claim 4, wherein [the] said minute periodic structure of [the] said grating portion is varied along [the] a periodic direction of [the] said grating portion.
6. (Amended) A diffractive optical element according to claim 5, wherein said minute periodic structure varied along the periodic direction of said grating portion is varied every step of [the] said step-shaped grating [stepped] portions.
7. (Amended) A diffractive optical element according to claim 4, wherein [the] said minute periodic structure of [the] said grating portion is varied in a grating thickness direction.

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8. (Amended) A diffractive optical element according to claim 7, wherein [the] said minute periodic structure varied in the grating thickness direction is varied every step of [the] said step-shaped grating [stepped] portion.

10. (Amended) A polarization converting element, [wherein] comprising deflecting means [is] provided so that an emergence direction of one of a P-polarized light beam and an S-polarized light beam which has undergone polarization-separation to be diffracted in a diffraction direction different depending on a polarization direction by said diffractive optical element according to claim 2 is made substantially coincident with an emergence direction of the other beam.

11. (Amended) A polarization converting element, [wherein] comprising a half-wave plate [is] provided in correspondence to one of a P-polarized light beam and an S-polarized light beam, which has undergone polarization-separation to be diffracted in a direction different depending upon polarization direction, by [the] said diffractive optical element according to claim 2.

12. (Amended) A polarization converting element, [wherein] comprising deflecting means [is] provided so that an emergence direction of one of a P-polarized light beam and an S-polarized light beam which has undergone polarization-separation to be diffracted in a diffraction direction different depending on a polarization direction by said diffractive optical

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element according to claim 2 is made substantially coincident with an emergence direction of the other beam and a half-wave plate is provided in correspondence to one of the P-polarized light beam and S-polarized light beam.

13. (Amended) A polarization converting element according to any one of claims 10 to 12, [wherein] further comprising an optical member [is] provided so that an incident direction of a light beam on said diffractive optical element is made substantially parallel to an emergence direction thereof.

FORM PTO 1449 (modified)				ATTY DOCKET NO. 03500.015390		APPLICATION NO. 09/866,587	
U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE				APPLICANT TAKEHIKO NAKAI			
LIST OF REFERENCES CITED BY APPLICANT(S) (Use several sheets if necessary)				FILING DATE May 30, 2001		GROUP 2872	
Submitted to the PTO: September 28, 2002							
U.S. PATENT DOCUMENTS							
*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
AV		5,581,405	12/1996	Meyers, et al.	359	571	
AV		6,317,268	11/2001	Harrigan	359	649	
FOREIGN PATENT DOCUMENTS							
		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES/NO/ OR ABSTRACT
OTHER DOCUMENT(S) (Including Author, Title, Date, Portinent Pages, Etc.)							
EXAMINER	Alexander V. Anni			DATE CONSIDERED	3/27/03		

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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